planets were high enough to observe with the large telescope they had separated too far to be brought into the field of view of the largest eye-piece. E. E. B.

MT. HAMILTON, Sept. 20th, 1889.

THE USES OF TRAILS OF STARS IN MEASUREMENTS OF POSITION OR OF BRIGHTNESS.

Photographs of star groups may be made for either one of three important objects. They may serve — (*a*) to give a picture merely; (*b*) for measurement of the relative positions of the stars of the group; or, (*c*) for measurement of the photographic magnitudes of the stars of the group. For the first purpose the stars must be photographed as points or *dots*. Such dots may also be used for the purposes *b* and *c*. For the purposes *b* and *c* it will often be very advantageous to employ *trails* instead of *dots*. The difference of declination of two stars, A and B, can be more accurately determined from measures made of the distance apart of their *trails* than from measures of the distance of the corresponding *dots;* just as a star can be more accurately bisected in declination by a Z. D. micrometer than in R. A. by a fixed thread. Hence the use of trails in R. A. If now we can produce trails in declination, a corresponding advantage can be had for measures of differences of R. A. The negative plate of the great equatorial is to be mounted on a compound slide-rest. The upper slide-rest which carries the plate has a motion in any desired direction (usually in R. A.), and the lower slide-rest, which carries both plate and upper rest, has a motion at right angles to the direction for the upper slide.

If a clock-work motion is attached to the lower slide, this slide can be moved in declination (say) for a certain distance (only). It will finally come to the end of its run. Suppose the telescope at rest, the objective covered and the lower slide-rest moving in declination. If an exposure is now made, we shall have trails suitable for measuring differences of R. A. After a few minutes, the lower slide comes to the end of its run. Trails in R. A. are now produced, which are suitable for measures of differences of declination.

The direction of motion of the lower slide may be ordered in *any* desired position angle. Thus we may choose the direction of the first set of trails so as to be most advantageous for the subsequent measures. The second set of trails will always be in R. A. The angle between the first and second directions will define the

position angle of the first trails. It is believed that this simple method will have important bearings on the determination of stellar parallax by photography, a research for which the great equatorial is especially fitted.

Trails may also be used to determine the magnitudes of the stars. The blackening of the plate is proportional to the photographic magnitude of the star and to the star's rate of motion on the plate (and to other things, also).

Two stars at different declinations will move at different rates on the plate and hence will produce trails of different intensity. A (theoretical) correction for the different rates of motion can be made and the measures of the relative intensities of the trails can be taken as measures of the relative magnitudes of the stars. This method has been extensively used by the Harvard College Observatory.

I will not here discuss the objections to the method, but will simply show how all objections can be overcome by adopting an ingenious proposal made by Professor SCHAEBERLE. His suggestion is to photograph the trails of all stars on a plate moving in declination at the same rate that an equatorial star moves in R. A. All trails will then have the same exposure. The rate of the clock which drives the plate in declination can be tested at any time by photographing *both* trails (R. A. and Dec.) of the same equatorial star.

It appears to me that a photometry of all stars sufficiently bright to give such trails should be made by this method. For fainter stars the method described by Professor SCHAEBERLE (*Publ. Ast. Soc. Pacific*, No. 4) should be employed. E. S. H.

LICK OBSERVATORY, July 15, 1889.